

An Advanced Smoke-Eater for Post-Fire Cabin Atmosphere Cleanup, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



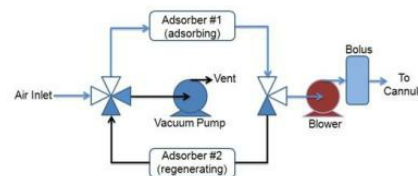
ABSTRACT

An on-board oxygen concentrator is required during long duration manned space missions to supply medical oxygen. The commercial medical oxygen generators based on pressure swing adsorption (PSA) are large and highly power intensive. TDA Research, Inc. (TDA) proposes to develop a small, lightweight, portable oxygen generator based on a vacuum swing adsorption (VSA) to produce concentrated medical oxygen. The unit uses ambient vehicle cabin air as the feed and delivers high purity oxygen while meeting NASA's requirements for high flow capacity, closed-loop tissue oxygen control and operation in microgravity/partial gravity. TDA's VSA system uses a modified version of the lithium exchanged low silica X zeolite (Li-LSX), a state-of-the-art air separation sorbent extensively used in commercial Portable Oxygen Concentrators (POCs) to enhance the N₂ adsorption capacity. In Phase I, we demonstrated the scientific, technical, and commercial feasibility of the oxygen concentrator module (OCM). In Phase II, we will develop a higher fidelity prototype with an adjustable pressure output to produce 2-15 lpm of O₂ at 50% to +90% purity from ambient cabin air. The OCM will be capable of self-regulating the oxygenation of the patient using a closed loop feedback system that senses tissue oxygenation level. We will evaluate the sorbent performance in a breadboard bench-scale prototype under simulated microgravity/partial gravity exploration atmospheres and carry out a 1,500 hr longevity test (at a minimum) to determine its mechanical durability. Based on the experimental results, we will design a prototype unit that will meet all of NASA's requirements (e.g., low power draw over the range of flows and oxygen levels, lightweight and volume), while delivering the desired oxygen flow and purity.

ANTICIPATED BENEFITS

To NASA funded missions:

Potential NASA Commercial Applications: An on-board oxygen

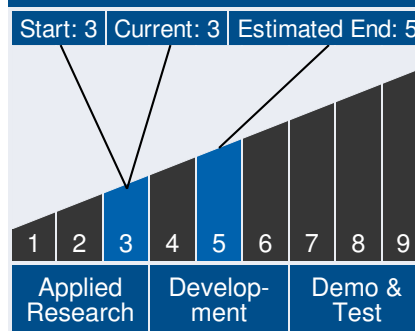


An Advanced Smoke-Eater for Post-Fire Cabin Atmosphere Cleanup

Table of Contents

Abstract	1
Anticipated Benefits	1
Technology Maturity	1
Management Team	1
U.S. Work Locations and Key Partners	2
Technology Areas	2
Details for Technology 1	3

Technology Maturity



Management Team

Program Executives:

- Joseph Grant
- Laguduva Kubendran

Program Manager:

- Carlos Torrez

Continued on following page.

An Advanced Smoke-Eater for Post-Fire Cabin Atmosphere Cleanup, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



concentrator will find application in long duration manned space missions and in International Space Station (ISS) and Orion spacecraft to supply medical oxygen by recovering the excess oxygen from the cabin air. The unit will be able to concentrate oxygen with little or no net change in the vehicle cabin oxygen concentration.

To the commercial space industry:

Potential Non-NASA Commercial Applications: The portable medical oxygen generator will also find immediate use in the medical evacuation platforms used in the military and civilian applications as well as in portable oxygen generators. The sorbent used in the system would also be applicable to bulk production of oxygen. Oxygen is a strategically important chemical, with a \$2.0 billion market value.

Management Team (cont.)

Principal Investigator:

- Gokhan Alptekin

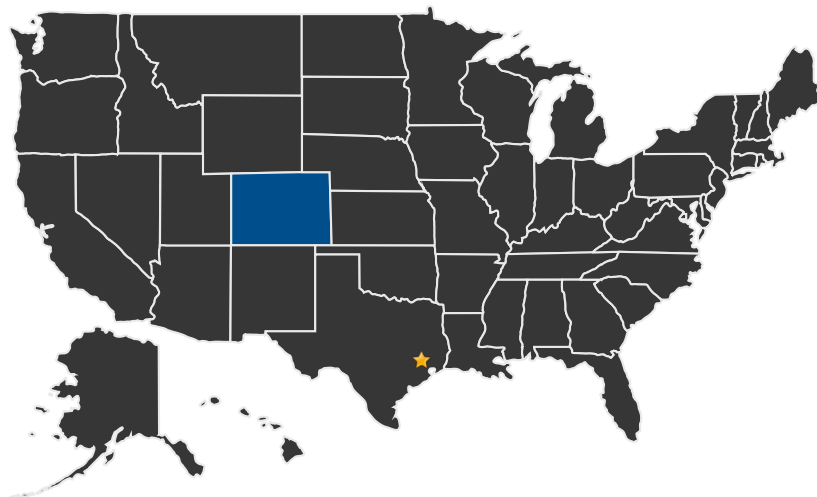
Technology Areas

Primary Technology Area:

Human Health, Life Support, and Habitation Systems (TA 6)

- └ Environmental Control and Life Support Systems and Habitation Systems (TA 6.1)
 - └ Air Revitalization (TA 6.1.1)
 - └ High-Pressure Oxygen Supply (TA 6.1.1.7)

U.S. WORK LOCATIONS AND KEY PARTNERS



■ U.S. States
With Work

★ Lead Center:
Johnson Space Center

Other Organizations Performing Work:

- TDA Research, Inc. (Wheat Ridge, CO)

An Advanced Smoke-Eater for Post-Fire Cabin Atmosphere Cleanup, Phase II Project

SBIR/STTR Programs | Space Technology Mission Directorate (STMD)



PROJECT LIBRARY

Presentations

- Briefing Chart
 - (<http://techport.nasa.gov:80/file/18209>)

DETAILS FOR TECHNOLOGY 1

Technology Title

An Advanced Smoke-Eater for Post-Fire Cabin Atmosphere Cleanup